



Germination response of *Arabidopsis* to concentration of Nitrates in an Aquaponic-Hydroponic system

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Abstract:

Arabidopsis thaliana (ecotype Columbia) was planted on sponges in 4 tanks with continuous aeration through airstones. Different amounts of fish under the same growing conditions for 5 weeks. An equal food-fish ratio was given to all tanks except the control which was a hydroponic setup with Murashige and Skoog solution, a plant growth medium, at 1/5 strength. The growth solution was changed once per week and fish water was partially changed every two weeks. pH, temperature, ammonia, nitrite, nitrate and plant number were recorded once per week. A slow growth was observed in all tanks and the control treatment died on the 3rd week.



Hypothesis

If production of ammonia by fish in an aquaponic culture of *Arabidopsis thaliana* is directly related to the concentration of nitrates in the water, there will be a higher amount of germinating plants as the number of fish increases.



Treatment

Tank 1	Tank 2	Tank 3	Control
2 fish	3 fish	4 fish	Murashige and Skoog
95 seeds	95 seeds	95 seeds	45 seeds



Results

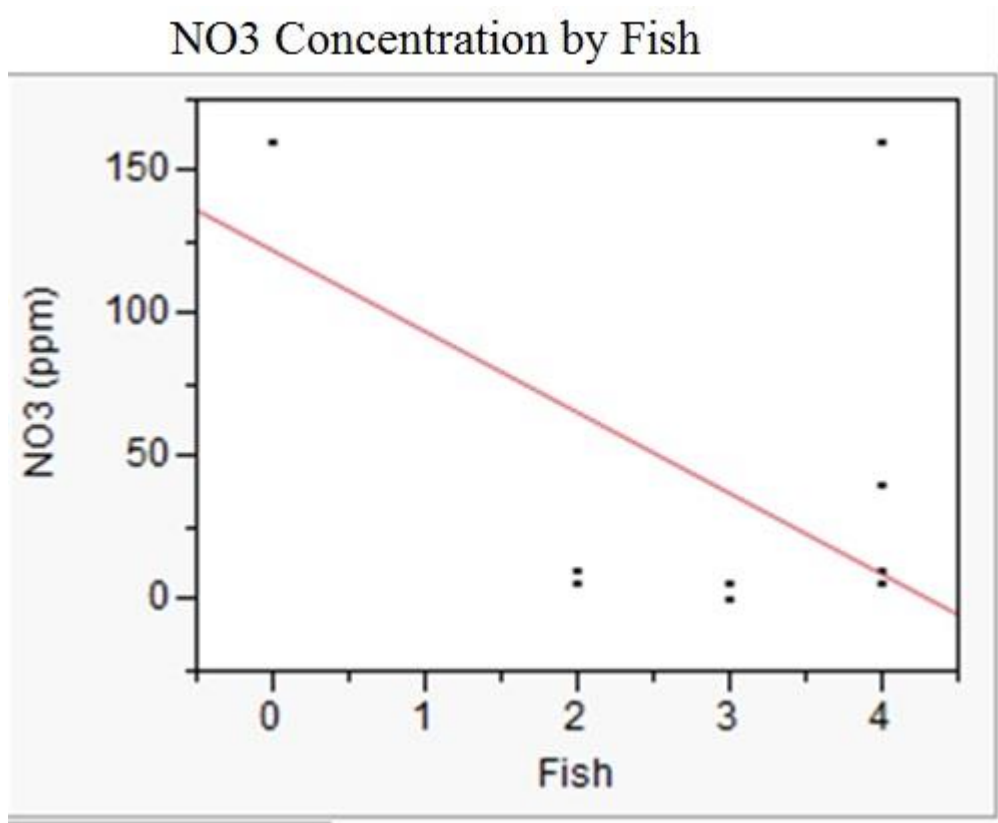


Figure 1: prob>F .0029*

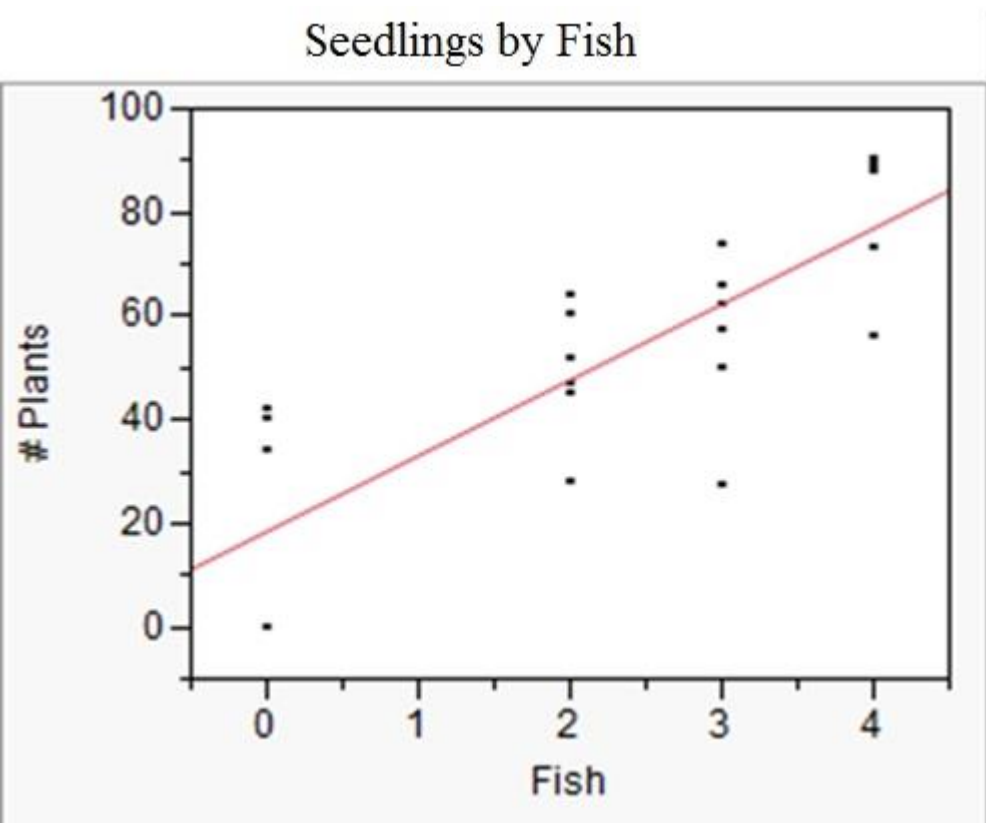


Figure 3: prob> F .0001*

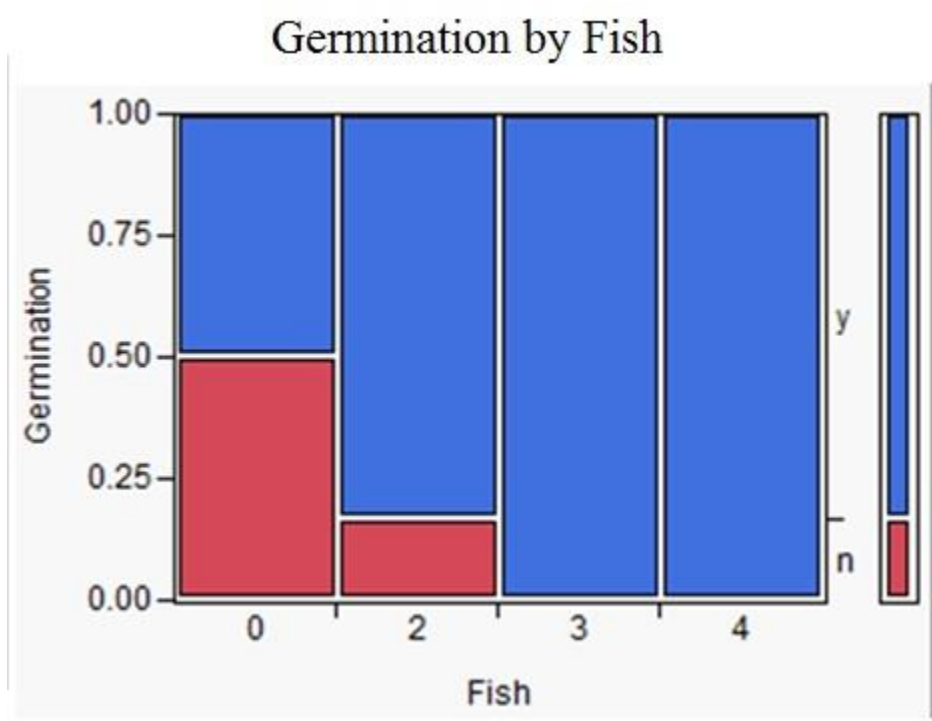


Figure 2: prob>chisq .0481*



The Link

The fish waste contains high levels of ammonia which nitrifying bacteria convert to nitrite and nitrate. The plants are able to absorb the non-toxic nitrate (NO₃⁻) as nutrient for growth and simultaneously reduce the nitrate levels in the tanks for the fish to survive.

Conclusion

1. High nitrogen concentration on the control treatment killed all the plants.
2. There was a higher amounts of nitrates in the tanks with more fish.
3. There was a significant germination number in the tanks with more fish.

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